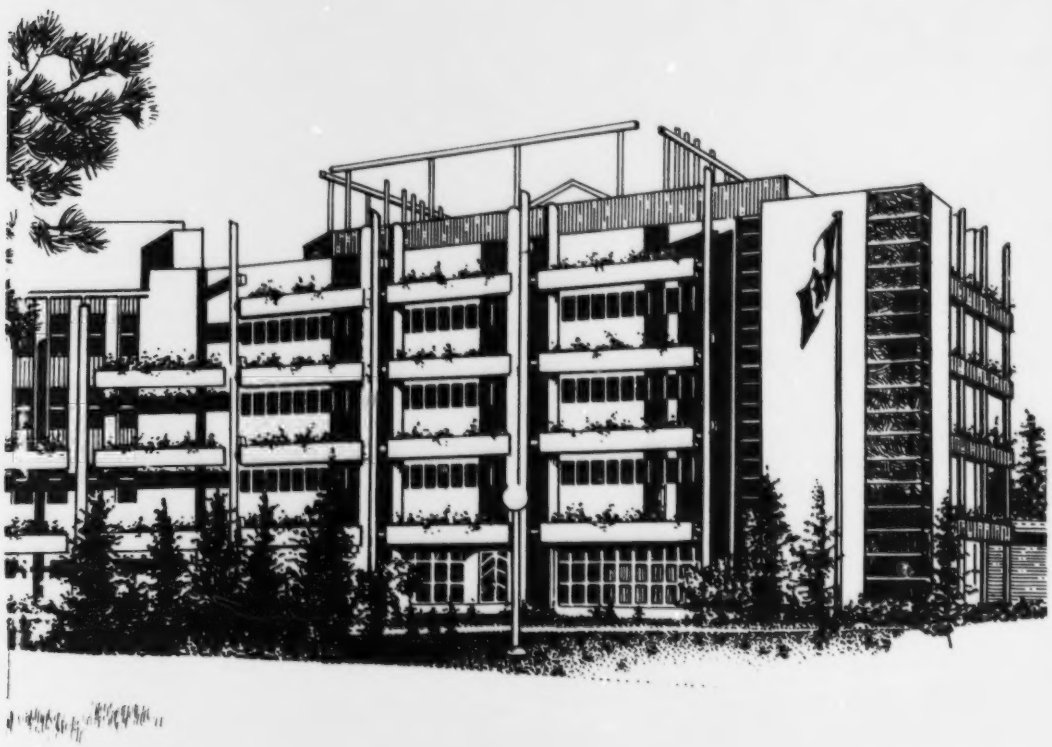
Program Review

Pacific Forestry Centre - 1987-88



Government of Canada
Gouvernement du Canada

Canadian Forestry Service
Service canadien des forêts

Program Review

Pacific Forestry Centre - 1987-88

Canadian Forestry Service - 1988

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The Canadian Forestry Service

The Canadian Forestry Service is the main focus for forestry matters in the federal government. It provides national leadership through the development, coordination, and implementation of federal policies and programs to enhance long-term economic, social, and environmental benefits to Canadians from the forest sector.

The service is a decentralized organization with six regional forestry centres, two national research institutes, and seven regional sub-offices located across Canada. Headquarters is located in the national capital region, in Hull, Quebec.

In support of its mandate, the Canadian Forestry Service carries out the following activities:

Administers forest development agreements negotiated with the provinces.

Undertakes and supports research, development, and technology transfer in forest management and utilization.

Compiles, analyzes, and disseminates information about national and international forest resources and related matters.

Monitors disease and insect pests in Canada's forests.

Provides information, analyses, and policy advice on economics, industry, markets, and trade related to the forest sector.

Promotes employment, education, and training opportunities in the forest sector.

Promotes public awareness of all aspects of the forest sector.

The service interacts regularly with provincial and territorial governments, industry, labor, universities, conservationists, and the public through such bodies as the Canadian Council of Forest Ministers, the Forest Sector Advisory Council, the Forestry Research Advisory Council of Canada, the Canadian Forest Inventory Committee, the Canadian Committee on Forest Fire Management, the Canadian Interagency Forest Fire Centre, and regional consultative committees. The service is also active in international forestry agencies such as the International Union of Forest Research Organizations and the Food and Agriculture Organization, as well as in technical and trade missions.

Le Service canadien des forêts

Le Service canadien des forêts est l'organisme principal en matière de foresterie à l'intérieur du gouvernement fédéral. Chef de file sur le plan national, il assure la préparation, la coordination et la mise en œuvre des politiques et programmes fédéraux dans le but d'améliorer les avantages économiques, sociaux et environnementaux à long terme offerts aux Canadiens par le secteur forestier.

Le Service est une organisation décentralisée: six centres de foresterie régionaux, deux instituts de recherche nationaux ainsi que sept sous-bureaux régionaux sont répartis dans tout le Canada. Le siège social est établi dans la région de la Capitale nationale, à Hull (Québec).

Pour remplir son mandat, le Service canadien des forêts assume les tâches suivantes:

il administre les accords de développement forestier conclus avec les provinces

il entreprend et appuie la recherche, la mise au point et le transfert technologique dans le domaine de la gestion et de l'utilisation des forêts

il rassemble, analyse et diffuse de l'information sur les ressources forestières nationales et internationales et les domaines connexes

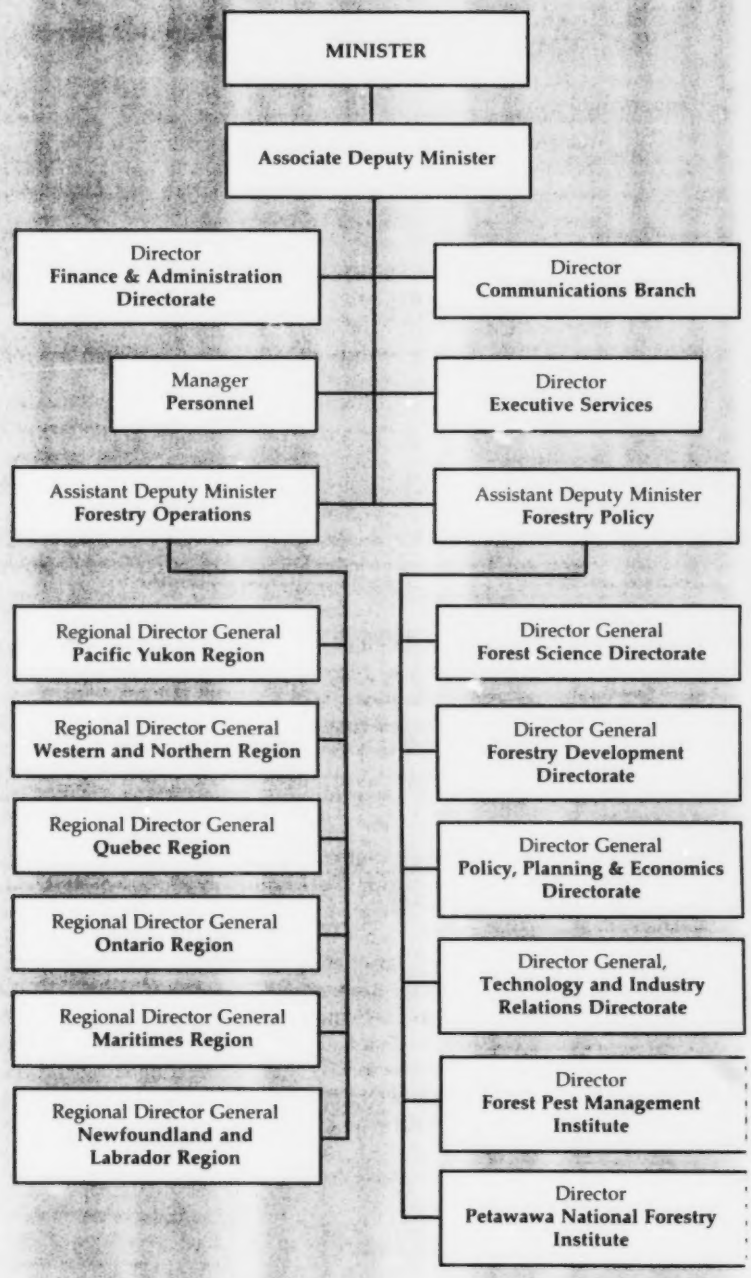
il fait des relevés des maladies et des insectes ravageurs des forêts canadiennes

il fournit de l'information, des analyses et des conseils (quant aux politiques) concernant l'économie, l'industrie, les marchés et le commerce reliés au secteur forestier

il favorise les occasions d'emploi et de formation universitaire et technique dans le secteur forestier

il encourage les Canadiens à prendre conscience de tous les aspects du secteur forestier.

Le Service entretient des rapports sur une base régulière avec les gouvernements provinciaux et territoriaux, l'industrie, le monde du travail, les universités, les environnementalistes et le public par l'entremise d'organismes comme le Conseil canadien des ministres des Forêts, le Conseil consultatif du secteur forestier, le Conseil consultatif de la recherche forestière du Canada, le Comité de l'inventaire des forêts du Canada, le Comité canadien de la gestion des incendies de forêt, le Centre interservices des feux de forêt du Canada et des comités consultatifs régionaux. Le Service joue également un rôle actif dans des organismes internationaux de foresterie comme l'Union internationale des organisations de recherche forestière et l'Organisation pour l'alimentation et l'agriculture, de même qu'au sein de délégations de nature technique ou commerciale.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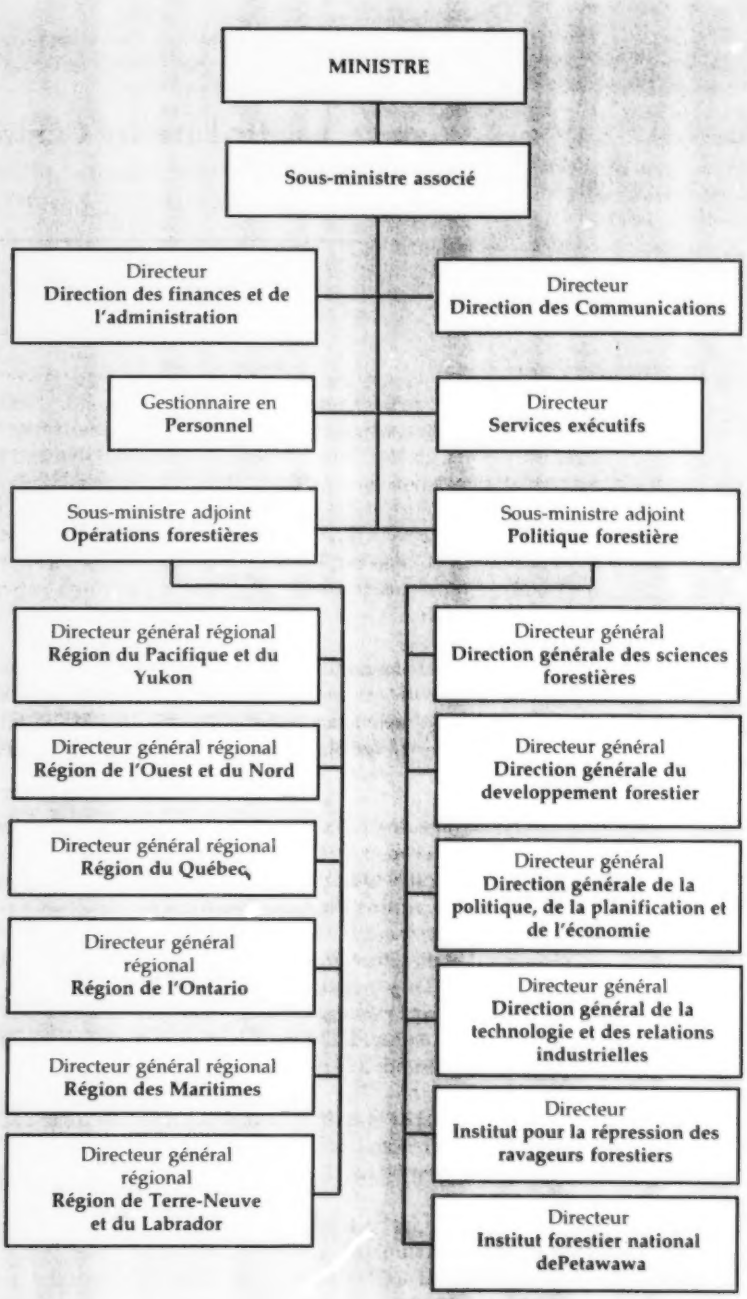
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Institut forestier national dePetawawa

Pacific Forestry Centre
A word from the
Acting Director-General

Dr. R.C. Dobbs

During the year under review . **Ross Macdonald**, Director General of the Pacific and Yukon Region (Pacific Forestry Centre), retired after serving over 35 years with the Canadian Forestry Service. He had been Director General of this region since 1980.

Jean-Claude Mercier, Associate Deputy Minster of the Canadian Forestry Service, appointed me, **Dr. R.C. Dobbs**, as Acting Director General until a formal appointment is made. My standing position is Senior Program Director, Research.

Other staff changes throughout the year were the retirements of several long-term staff members including: **Dick Andrews**, FIDS Ranger; **Hugh Craig**, pathology technician; **John Edwards**, Senior Program Director, Development; **Dr. Walter Stanek**, research scientist; and **Dr. John Hopkins**, research scientist.

New staff joining us included: **Dr. Ron Wall**, research scientist; **Gary Townsend**, forest economist; **Dr. John Sweeney**, Post-Doctoral Fellow, NSERC; **Dave Haley**, Forestry Officer; **Art Shortreid**, Technology Transfer Forestry Officer and, **Dr. Caroline Preston**, research scientist.

Several staff returned to the Pacific Forestry Centre after being on education leave. They included: **Al Mitchell**, away for 3 years and returning with a Ph.D in tree physiology; **Donna Macey**, away for 3 years and returning to complete work on her Ph.D dissertation; and, **Paul Commandeur**, returning after 2 years leave with a M.Sc in forest hydrology.

In addition, **Lee Humble**, head of our insectary, obtained his Ph.D, and **Steve Taylor**, fire research officer, earned his M.Sc. in forestry. Also, **Dr. Hugh Barclay** was promoted to a Research Scientist 3 level during the year.

The year under review was the third year of the five-year $300 million Canada-British Columbia Forest Resource Development Agreement (FRDA). During this period activities under the Agreement resulted in the creation of

over half a million days of employment throughout the province. Over 450,000 hectares were surveyed or received silviculture treatment, and 78 million seedlings were planted. Over $140 million was spent under FRDA during year 3 - 1987/88.

Some reorganization of projects and studies took place during the year as a result of our on-going review of priorities and goals. A revised organization chart appears on page 63 for your reference.

Dr. R.C. Dobbs
A/Director General
March 31, 1988

Forest Growth and Biology Research

R.C. Dobbs, Senior Program Director, Research

D. Pollard

E.R. Gardner

V.G. Marshall

A.K. Mitchell

C. Preston

T. Trofymow

Growth and biology: Douglas-fir ecosystems

Project Leader: Dr. H.D. Pollard
Professionals: E.R. Gardner, Dr. V.G. Marshall, Dr. A.K. Mitchell, Dr. C.M. Preston, Dr. T. Trofymow
Technicians: M. Clayton, C.R. Layton, K. McCullough, F.T. Portlock

Objectives

Through a balanced program of fundamental and applied research and technology transfer, to improve understanding of tree growth and biological processes of soil and trees in a Douglas-fir ecosystem in response to thinning and fertilization.In addition, to develop a biologically based mechanistic model for growth using information obtained.

Achievements

Research continued on thinning and nitrogen fertilization effects on soil chemistry, soil water, soil microflora and fauna and their interrelationship in nutrient cycling and nutrient availability to trees. This, combined with improved understanding of the physiological response of trees to treatments, is the basis for the development of a biological model of stand management effects on ecosystem response and stand growth.

Foliar nutrient analysis of trees fertilized twice with nitrogen indicated a deficiency of sulfur and phosphorus. To investigate this response, eight new plots treated with different combinations of nitrogen, phosphorus and sulfur have been installed.

Reports were published on the fate of nitrogenous fertilizers, mechanisms of tree and stand response to fertilization, distribution of nutrients in above-ground biomass, and effects of glyphosate on soil organisms. A Catalogue of Oribatida (Acari) and the Introduction to a conference on "Roots in forest soils" were published. Information and technology were transferred to 69 representatives of industry, governments and the scientific community visiting the Shawnigan installation.

Projections

A synthesis of project results, which have been presented in part in over 60 reports, will be completed. The 15-year growth response will be reported. A comprehensive analysis of biomass distribution and of allocation of nutrients to its above-ground components will commence to provide detailed information on the growth response over the period 1980-1989. N-15 tracer techniques will be applied to the elucidation of transport and transformation of nitrogen in the ecosystem. Information obtained will be incorporated into the SHAWN model, which will predict stand-tending effects under different site conditions.

G.M. Bonnor

R. Alfaro

Y.J. Lee

Forest growth and measurement

Project Leader: Dr. G.M. Bonnor
Professionals: Dr. R. Alfaro, Dr. Y.J. Lee
Technicians: B. Brown, J. Dronzek, E. Wegwitz

Objectives

In cooperation with other forest agencies, to develop, refine and apply methods of assessing effects of: silvicultural treatments on growth and yield; growth and yield of natural stands; catastrophic depletions due to pests and other causes; and static and dynamic inventories, for the purpose of improving intensive forest management practices.

Achievements

The collection of sample plot data, assessment of data, and reporting of results related to damage and loss caused by tussock moth, spruce budworm, spruce weevil and western false hemlock looper continued. Four related reports were produced.

The Yukon reconnaissance inventory was completed, and a draft report was produced.

Data was acquired for growth modelling of interior Douglas-fir, and the development of a model began. Results of a preliminary study were published.

Information concerning the response of hemlock to fertilization and spacing was reviewed; as a result, an approach to future research was recommended.

Project staff continued as cooperators on the Levels-of-Growing-Stock (LOGS) study. The Sayward Forest installation had its fourth treatment thinning in the fall of 1987.

Pest damage imagery was acquired and analyzed. A report on the use of Landsat TM data for clearcut monitoring was prepared.

Assistance and data were provided for the Coastal and Interior Forest Productivity Councils.

Five additional reports, on inventory-related topics, were published.

Projections

Work on pest damage appraisal and impact model development, data acquisition and growth modelling of interior Douglas-fir, participation in the LOGS study, and remote sensing imagery analysis will be continued.

The Yukon inventory reconnaissance report, a remote sensing paper, and other study results will be published.

A.J. Thomson

H.J. Barclay

Systems studies in forestry

Project Leader: Dr. A.J. Thomson
Professionals: Dr. H.J. Barclay

Objectives

To evaluate the effects of selected pests and forest management practices on tree and stand growth, and develop elements of models and management systems.

Achievements

Publications were prepared on a range of pest management models. A model was constructed to simulate the population dynamics and spread of mountain pine beetle populations in B.C. This model will also be used to asses the feasability of various control measures in containing endemic populations.

Projections

Mountain pine beetle models will be transferred to the provincial Ministry of Forests , and a Douglas-fir growth and yield analysis system will be transferred to industry.

Forest Renewal and Environment Research

D.A. Winston, Program Director

J.T. Arnott

D.G.W. Edwards

S. Eis

D.E. Macey

Seeds, nurseries and regeneration

Project Leader: J.T. Arnott
Professionals: Dr. D.G.W. Edwards, Dr. S. Eis, D.E. Macey
Technicians: D. Beddows, G.J. Goodmanson, F.T. Portlock and D.W. Taylor

Objectives

To develop, evaluate and enhance tree seedling production and establishment methods. To enhance the quality and quantity of forest tree seed in B.C. and the Yukon, by developing improved methods for forecasting, procurement, processing, utilization and certification of seeds. To administer international schemes for seed certification (OECD), seed sampling and testing (ISTA).

Achievements

The long-term study of tree growth in 15- to 20-year-old Coastal plantations of container-seedling origin continues within this project. Results to date show that plantations of plug-seedling origin show no growth abnormalities and remain wind firm.

High-elevation species and stock type trials, run in cooperation with the B.C. Ministry of Forests, continue to be measured biannually. Tenth-year growth measurements indicate that noble fir show much promise as an exotic for introduction to the montane coastal ecosystems.

Photoperiod research in container seedling nurseries indicates that a one- or two-hour break of supplemental light in the middle of a dark period is as effective as conventional day length extension is in promoting shoot growth of long-day species.

The impact of drought stress versus short-days as a way to control the shoot growth of western hemlock and western red cedar in container seedling nurseries is being studied in cooperation with others. In the first investigation, Dr. J. Owens of the University of Victoria is studying the treatment response on seedling morphology of western hemlock, and CFS and MacMillan Bloedel researchers are evaluating the physiological response. The impact of these nursery treatments on the subsequent field performance of the seedlings is being investigated cooperatively by all three agencies. In the second investigation, Dr. S. Grossnickle, B.C. Research Corp. and CFS staff are investigating the impact of such treatments on the morphological and physiological development of both species in the nursery. This study will carry on for two years after planting of seedlings at a test site near Lake Cowichan.

Following trials in Alberta, further work was carried out at the new B.C. Ministry of Forests and Lands Seed Centre, Surrey, on the testing of a commercially-built seed drier in the operational application of the IDS seed-sorting method. These tests showed that seeds in layers up to 25 mm in depth (the

deepest tested) could be successfully dried to meet IDS requirements. Aerated water soaks of western white pine seeds were found to largely replace the several-week, warm stratification treatment for breaking dormancy. Ten-day soaks of yellow cedar seeds were also found to greatly enhance germination. A review of the reproductive biology of western red cedar, including some observations on seedling production and prospects for seed orchards, was presented at a Symposium at the University of British Columbia, and will appear in the symposium proceedings (1988).

Certificates representing more than 2100 kg of seeds to be traded internationally were issued under the official seed certification (OECD and ISTA) program. A manual for testing tree seeds in Canada has been published. A series of four, 3-day, "hands-on" tree seed testing workshops were organized and held at various locations across the country. More than 130 individuals, representing major provincial and private seed extraction and testing centers, private nurseries, provincial and industrial nurseries, educational institutions, federal and provincial seed researchers, and foresters working on forest renewal, attended. Most provinces and territories were represented.

Project staff have been providing photographs of B.C. species and editorial input for the forthcoming edition of "Trees of Canada." Earlier research on root system development in mature trees has been published.

Study of the dynamic changes in endogenous hormone levels during in vitro meristem initiation, bud development and shoot elongation was completed. This work suggests that shoot development is controlled, in part, by temporally specific levels of abscisic acid and indoleacetic acid, although cytokinin levels may be the most important endogenous hormone regulating shoot morphogenesis. Results from this Ph.D. research program will be applied to the study of similar phenomenon in container-grown seedlings in response to environmental and cultural stimuli.

Projections

To conduct more basic research on the impact of nursery cultural regimes on the morphological and physiological development of container-grown seedlings, and to evaluate how these parameters affect the success of tree seedling establishment in the field. Tissue culture technology will be used as a vehicle for understanding the physiology of shoot development and its regulation at the tissue and cellular levels.

To continue long-term monitoring of species and stock type trials already established.

To develop the IDS seed sorting method for use on an operational scale, and to improve and refine methods for overcoming seed dormancy in western white pine and yellow cedar.

B.D. Lawson

Fire research

Project Leader: B.D. Lawson
Professionals: B.C. Hawkes, S.W. Taylor
Technicians: G.N. Dalrymple, M.A. Grismer

B.C. Hawkes

S.W. Taylor

Objectives

To develop fire behavior prediction systems for major fuel types, and to incorporate this knowledge within the Canadian Forest Fire Danger Rating System, a national framework designed to assist fire management agencies with forest resource protection. To develop methods and models to incorporate fire effects knowledge into land management practice, in order to improve the application of prescribed fire to a variety of silvicultural problems.

Achievements

The national Users' Guide to the Canadian Forest Fire Danger Rating System (CFFDRS) was completed and distributed to fire management agencies within the Pacific and Yukon Region.

Work continued on the CFFDRS's Fire Behavior Prediction (FBP) System, a cooperative effort by the CFS Fire Danger Group. Progress was made on the cooperative experimental fire study in lowland black spruce forests, which was led by Northern Forestry Centre in Alberta, and in developing fuel-consumption and fire-intensity models for the 14 fuel types presently in the FBP System.

Related work began on regional calibration and testing of a slash moisture-content model, with a field study established in spruce-balsam slash in the central interior of B.C. This work will provide input to the Accessory Fuel Moisture System of the CFFDRS, and may be applied to silvicultural prescribed burning decision-aids.

Prescribed fire research at PFC continued on several fronts. The FRDA cost-shared and federal component sub-programs supported several studies that were led or supervised by the PFC Fire Research Unit. An intensive, long-term study of prescribed fire, combined with chemical and mechanical site preparation treatments, was implemented in the Prince George region of B.C. The goal of this work was to determine optimum treatment options and effects in rehabilitating backlog NSR lands in the north-Central Interior. All treatments were successfully applied during 1987. A companion study by PFC, which involved the monitoring of operational prescribed fires for backlog site preparation, progressed, with additional burns monitored, and cooperative assistance provided with data gathering on other burns. Early results from this study were presented in a workshop paper.

The Fire Research Unit managed several contract studies in prescribed fire during the year, including studies by UBC's Forestry Faculty and Department of Soil Science, and a long-term study by MacMillan Bloedel Ltd. Reports on two of these studies are nearing completion, and PFC staff are providing

significant input.

The project leader attended a five-week fire management study tour of Australia in February-March, 1988, representing Canada on a regular trilateral exchange program in forest fire with the U.S. and Australia. All states and territories of Australia were visited, with emphasis on wildland/urban interface fire protection.

Projections

Completion of a draft publication on the FBP System, including rate of spread, fuel consumption and fire intensity components for 15 Canadian fuel types, is planned for 1988. Completion of the second year of field study on the slash fuel moisture model evaluation, data analysis and presentation of initial results is planned.

The intensive backlog NSR study sites will be planted and initial seedling survival and growth assessments will be carried out. The effects of the treatments on soil nutrients, vegetation, and microclimate will be studied. Additional operational backlog burns will be monitored.

On the national scale, a new study of large-scale prescribed fire emissions and smoke dispersal will be a priority, with first year research burns led by Great Lake Forestry Centre in Ontario. These will begin in 1988.

The project leader is chairman of Northwest Fire Council for 1988 and will host the annual meeting, with executive assistance from Mr. Hawkes, who will serve as secretary/treasurer.

Carnation Creek fish/forest interaction

R.B. Smith

E. Hetherington

Project Leader: Dr. R.B. Smith
Professionals: Dr. E. Hetherington
Technicians: R.K. King, R.J. Rowswell

Objectives

To conduct forestry, hydrology, vegetation and soil studies at Carnation Creek for use in the development of appropriate forest harvesting practices for coastal salmonid-producing watersheds.

Achievements

Data collection at the steep slope, subsurface stormflow, and fog-drip precipitation study site continued for the 5th year. Summer monitoring of valley bottom groundwater levels (in its 12th year of measurement) was extended to cover additional sites during the winter period.

A major 3-day Carnation Creek Herbicide Workshop was held in December, 1987. A paper by E. Hetherington entitled "Carnation Creek floodplain

hydrology: September 1984 - September 1985" was presented.

The 10th-year revegetation assessments were completed for 89 plots in two units. Under contract, a report was prepared on analysis of the first five years of revegetation data.

Projections

Further subsurface flow measurements and experiments will be conducted, and summer valley bottom groundwater levels and fog-drip precipitation will be monitored. A hydrology paper will be presented at the Canadian Hydrology Symposium in May, 1988. Other hydrology reports will be prepared.

A 10th-year assessment will be made on a further 21 revegetation plots. The contract report on multivariate analysis of the first five years' revegetation data will be reviewed, and a decision will be made on approaches to analysis of the 10th-year data.

Environmental impact of forestry practices

R.B. Smith

P.R. Commandeur

J.P. Senyk

Project Leader: Dr. R.B. Smith
Professionals: P.R. Commandeur, J.P. Senyk,
Technicians: R.J. Rowswell, E.F. Wass

Objectives

To identify, measure and explain the effects of harvesting, site preparation and stand tending practices on forest environments and productivity to support existing good practices and lead to the development of new practices where required.

Achievements

Foliage analyses and needle-weight measurements were completed for all samples from the Vernon and Grand Forks soil disturbance (stumping) plantations. Analysis of 5-year results from these two plantations was nearly completed and a report initiated. Summaries of heights, diameters and volumes were completed for two younger plantations (Golden - three years and Clearwater - two years). Some results from the plantations were presented at the X1V International Botanical Congress in Berlin.

Water sampling and analyses, hydrometeorological data collection and processing, and a depth-profile survey of one lake were carried out for the small-lakes, forest fertilization/water quality impact study near Victoria.

Post-harvest soil sampling and soil chemical and physical analyses were completed for the coastal, winter, ground-skidding study. Seedling trials were

established in disturbed and undisturbed portions of this cutover.

Soil sampling was completed for site-prepared areas near Golden.

A study examining harvesting-induced soil disturbance and soil degradation was initiated in the Golden area in cooperation with B.C. Forest Service, Evans Products and the Forest Engineering Research Institute of Canada.

Paul Commandeur completed a Master of Science thesis on stress transfer between Douglas-fir roots and soil. Work commenced on a paper and technical note based on the thesis. A problem analysis entitled "Soil erosion consequences of forest management practices" was initiated, and an ENFOR study entitled "Impact of biomass harvesting on soil disturbance and surface soil erosion" was developed for contracting out.

Project members became closely involved in activities aimed at reducing soil degradation from forestry operations, including active participation on the Technical Advisory Committee to the newly formed Interior Forest Harvesting Council and on several regional harvesting subcommittees.

Projections

A paper on 5-year results from the Vernon and Grand Forks stumping, soil-disturbance plantations will be completed and the latest (September, 1988) growth data on the other three plantations analysed.

Field sampling of lake water quality following forest fertilization will be concluded and a summary report prepared. Final hydrology reports on the fertilizer-on-snow study will be prepared.

A report will be completed on the coastal, winter, ground-skidding study and data analysis completed for the mechanically site treated area near Golden.

Pre- and post-harvest soil and transect sampling will be completed for the summer-logged sites at Golden, as will and pre-harvest sampling for the proposed winter-logged sites.

The soil erosion problem analyses will be completed, the ENFOR contract awarded and supervised and a new erosion-related study initiated.

Forest weed control strategies

G.W. Coombs

Project Leader: G.W. Coombs, R.P.F.
Professionals: Dr. C.E. Dorworth, D. Haley, Dr. E.T. Oswald, Dr. R.E. Wall, R.J. Whitehead
Technicans: B.N. Brown, R.K. King, T.A.D. Woods

C.E. Dorworth

Objectives

To develop forest management strategies aimed at minimizing the effects of non-crop vegetation on crop species survival and growth. To develop an understanding of the dynamics of productive forest sites in B.C. at various stages of development, from pre-harvesting to plantations 20 years old, by looking at the interrelationships of site characteristics and ecosystem

D. Haley

E.T. Oswald

R.E. Wall

R.J. Whitehead

components, and their effects on vegetation succession and site productivity. To identify and develop forest weed control methods, including motor-manual, biological and chemical, both singularly and in combinations, during the early stages of plantation development which will achieve an optimum balance between silvicultural efficacy and impacts on other resource values. To develop PFC as a centre of excellence in Canada in forest vegetation control, and in particular in the field of biological control.

Achievements

This was the first full year where the project looked at the total vegetation community to develop techniques which could be used to manipulate the non-crop vegetation to maximize crop species survival and growth. Some major accomplishments resulted from various studies. Under the remote sensing study, plots were established and 70mm aerial photos taken of vegetation competition in 2 young conifer plantations near Cowichan Lake on Vancouver Island. Computer digitizing of 70mm photos of vegetation competition of the Bush River study plots was completed.

The biocontrol study was divided into 2 studies. Work carried out under one of these included: collection of fungi from salal, red alder and bigleaf maple; setting up field plots with fungi inoculations on salal and bigleaf maple on Vancouver Island; and inoculation of alder in the greenhouse. The work carried out in the other study included the collection of fungi from 45 host specimens, and exploratory inoculations carried out using a total of 20 fungi in field testing on red alder and bigleaf maple and in the greenhouse on thimbleberry. In addition, work began on a study looking into the use of fungi to control thimbleberry and aspen in the Nelson Forest Region.

Under the ecology study, 116 additional plots were established in the Glenogle Creek study site. Nutrient analyses were carried out on Englemann seedlings used in the study. In addition, work was initiated in False Azalea propagation in the field and in the greenhouse. A new study site was identified in Skelly Creek near Creston.

Field assessments were carried out on the herbicide plots in Carnation Creek. The first-year assessments were also carried out on the plots in the Bush River area. Two research studies on brush-saw productivity and biological evaluation, funded under the Forest Resource Development Agreement (FRDA) federal component program which will directly support this study, were established in the Redfish Creek area near Nelson.

The past year saw yet another shift in study leaders, with Dr. W. Stanek (Autecology) retiring and Dr. R.E. Wall (Biocontrol) coming to PFC from the CFS - Maritimes. With the retirement of Dr. Stanek, the research into the autecology of forest weeds has been put on hold. The addition of Dr. Wall has brought together at PFC the only two researchers in Canada who are carrying out research on the biocontrol of forest weeds.

Extensive information exchange in the form of lectures, meetings and discussions was again made by individuals under the project. This technology transfer involved the B.C. Ministry of Forests, B.C. Ministry of Environment and Parks, industry, universities, the Silvicultural Committee (Coast, Northern

and Southern Interior), Silvicultural Institute of B.C. and other groups. PFC's active involvement with the Expert Committee on Weeds continued, with John Manville as chairman of the silviculture section, and Roger Whitehead as the section summarizer.

Projections

Studies under this project will continue to re-measure and analyze established plots and associated data. As well, new study plots will be established. The ecology study will assess and analyze the data from the vegetation succession studies near Golden. In addition, plots will be established in settings scheduled for summer and winter logging in Skelly Creek, near Creston. Stock type and planting studies that relate to vegetation succession will be established in this area. The biological study, with the addition of Dr. R.E. Wall to work along side of Dr. C.E. Dorworth, will expand the collection, isolation, screening and testing of potential biocontrol agents for salal, fireweed, thimbleberry, salmonberry, alder and aspen on the Coast and in the Interior. In addition, work will be carried out on the establishing plots, and assessing inoculations will be carried out with identified potential biocontrol agents in the greenhouse and in the field on the identified target species. As a note, PFC has the only researchers in North America carrying out forest biocontrol research to determine whether this method can be used to control undesirable forest vegetation. The crop response study will complete the efficacy analysis of the year-two results of the motor-manual and herbicide study in Bush River. The year-one results of the motor-manual study in Redfish Creek, near Nelson, will be assessed. A complete exploratory analysis of the year-three data for the crop and non-crop species response to the 1984 Glyphosate treatment in Carnation Creek will be carried out. In addition, site selections will be made for additional efficacy studies in the Southern Interior. The remote sensing study will test the accuracy of using low level photography and complete digitizing to determine the vegetation succession and crop-tree response of plots established under the Crop Response Study in Bush River. Further work will be carried out on plots established on Vancouver Island using 70mm photography and line transects to refine techniques of analyzing digital data of crop and non-crop competition in young conifer plantations.

An effort will be made to provide information to the forest community and other resource agencies through technology transfer of the results of the work carried out in the various studies under this project.

J.F. Manville

J. Pannekoek

R.H. Silversides

C.S. Simmons

Specialized collaborative research and statistical services

Project Leader: Dr. J.F. Manville
Professionals: Dr. J. Pannekoek, Dr. R.H. Silversides, Dr. C.S. Simmons
Technicians: R. Benton, T. Fraser

Objectives

To provide specialized skills in the areas of analytical organic chemistry, scientific computing, forest meteorology and applied statistics through a series of contractural collaborative studies throughout all program areas within PFC.

Achievements

Analytical organic chemistry. Upgraded the Fourier Transform Infrared accessories for more effective chemical investigations, such as non-destructive species identification experiments on wood specimens. Analysed conifer foliage terpene samples for chemotaxonomic identifications and stress induced chemical changes. Isolated and identified structures of sesquiterpenoids from the whole wood of coastal alpine fir (A. lasiocarpa) to establish a chemical basis for separating this true fir from interior alpine fir (A. bifolia). Reviewed the literature on stress induced chemical changes in plants. Published two manuscripts.

Forest meteorology. Devised sampling scheme and set up instrumentation configured on 7 automatic data loggers to collect and report data on climate differences and effects following herbicide / prescribed burning / mechanical site treatments at Stony Lake 90 km southeast of Prince George. Developed instrument system components and sensors such as seedling stem temperature analogues, multiplexers, telemetry etc. Improved data handling and analysis procedures using SAS. Provided support to other PFC studies e.g., monitoring infection episodes by white pine blister rust, leader temperatures affecting shoot weevils, monitoring climate for bark beetle, black-headed budworm, seedling regeneration etc.

Applied statistics. Provided advice and assistance to PFC staff in analyzing research data, instructed staff in the use of the statistical packages SAS and Minitab.

Projections

Work in the analytical organic chemistry study will be extended on chemotaxonomic studies of terpenes, wood extractives, pheromones. FTIR and NMR to include problems with pests, taxonomy, wood quality and with additional LRTAP funding, air pollutants effects on conifers. A new study, Scientific computing, will provide scientific computing support and conduct

an assessment of image processing/graphics/mapping systems and technologies to provide PFC with a unified cost-effective solution for applying this technology to research problems. The development, through contract, of an MS-DOS-based field portable electronic tally device will be undertaken. Forest meteorology study will examine climate effects on seedling establishment, pests and tree growth, and long-term fire weather in B.C. and the Yukon will be examined. The statistical services study will continue to provide PFC research staff support in statistical design and analysis, undertake the development of MENUSAS to help researchers to access the power of SAS, and training procedures will be improved and expanded to include MENUSAS.

Forest Protection Research

G.E. Miller, Program Director

G.A. Van Sickle

A. Funk

L. Humble

Forest insect and disease survey (FIDS)

Project Leader: Dr. G.A. Van Sickle
Professionals: Dr. A. Funk, Dr. L. Humble
Technicians: R.J. Andrews, D.H. Clarke, R. Duncan, R.D. Erickson, R. Ferris, R.W. Garbutt, N. Humphreys, H.P. Koot, J. Loranger, D.P. Lowe, E. Pass, A. Stewart, R. Turnquist, L.S. Unger, J. Vallentgoed, C.S. Wood.

Objectives

To provide part of an annual national overview of important forest insect and disease conditions, including acid rain, and their implications. To conduct quarantine-related surveys and activities. To support research by maintaining historical records, monitoring, reporting and providing requested collections and observations whenever possible. To provide liaison and technology transfer on behalf of CFS and FIDS to the forest community. To develop methods to improve forest insect and disease sampling techniques.

Achievements

The annual monitoring and assessment of forest pest conditions in British Columbia and Yukon was conducted, and results were presented at national and regional forest pest reviews and were published. The most damaging insect in western Canada continued to be mountain pine beetle, with damage spread over 66 470 ha. Spruce beetle infestations declined to 3300 ha.

Defoliation of Douglas-fir by western budworm increased two fold to 834 000 ha, while Douglas-fir tussock moth populations remained at low levels. Eastern spruce budworm defoliated 59 400 ha in the Ft. Nelson area and 2-year cycle budworms infested 48 250 ha in the Central Interior. Western blackheaded budworm and hemlock sawfly declined to 14 100 ha, mainly on the Queen Charlotte Islands. Larch casebearer was generally endemic. A new infestation of western hemlock looper occurred in the Vancouver Forest Region. Major problems in mature and immature forests continued to be root rots, dwarf mistletoes, rusts and canker diseases. Black army cutworm killed and severely defoliated seedlings in slash-burned sites in the East Kootenay Region but declined in the northern interior. Cone and seed pests were widespread and destroyed up to 88% of the Douglas-fir cones. Quarantine-related surveys found pinewood nematode in only six stands. Gypsy moth occurred six sites. Fifteen plots were established as part of the national acid rain early warning system in the region.

Projections

A general survey in support of a national overview of important pest conditions will be conducted and reported. A compilation of 35 years of

records of parasites of common insects in B.C. is in preparation. A computer assisted mapping and analysis system is in use and will be linked to other data bases such as the national forest inventory. A national pest record retrieval system (INFOBASE) is operating at PFC and will be developed further.

L. Safranyik

Bark and wood-boring insects

Project Leader: Dr. L. Safranyik
Professionals: Dr. F.G. Peet, Dr. T.S. Sahota,Dr. T.L. Shore
Technicians: R.E. Betts, A. Ibaraki, D.A. Linton

F.G. Peet

Objectives

To develop and promote management guidelines to reduce losses incurred by major bark and wood-boring insects.

T.S. Sahota

Achievements

Fourteen scientific and technical publications concerning various aspects of bark beetle biology and management were prepared by project scientists.

As part of the Canada/USA Agreement on mountain pine beetle, measurement of tree increment cores from the 150 plots that were established in lodgepole pine stands to evaluate six hazard rating systems is near completion. Methodology and programs for evaluating the hazard rating systems have been developed. In cooperation with the B.C. Ministry of Forests and Lands, and as part of studies to reduce losses from the mountain pine beetle, five 5-ha plots of mature lodgepole pine were marked for diameter limit cuts and spacing trials near Merritt, and the treatments were applied.

T.L. Shore

In studies of beetle population quality, mountain pine beetles emerging sequentially from lodgepole pine trees did not differ significantly in quality as indicated by chromatin distribution patterns. This result casts doubt on the concept of the "pioneer" beetles being histologically different from their later-emerging siblings.

A cooperative field study with Dr. B.S. Lindgren, Phero Tech. Inc., to assess the effects of the antiaggregating pheromone verbenone on mountain pine beetle dispersal behaviour in lodgepole pine was inconclusive. The study will be repeated in 1988. All mountain pine beetle dispersal data collected between 1982 and 1985 have been analysed. As part of a study on the effects of mountain pine beetle outbreaks on the structure of lodgepole pine stands, 10 stands have been sampled in the Cariboo Region.

Some highlights of advice and technology transfer work by project participants were as follows: as no contract was awarded during 1987/88 to further develop the tree saw, field testing was not required. Drs. Whitney, Moeck and Safranyik reviewed a new contract proposal by Mr. D. Moulson of

Vancouver for the completion of research and development on the tree saw. Drs. Shore and Safranyik located two areas for demonstration of the effects of spacing and selective logging on the mountain pine beetle in lodgepole pine stands. Dr. Shore supervised the layout and marking of one of these areas for logging, and he is working with the B.C.F.S. in Merritt and Quesnel districts to complete these projects. Dr. Shore reviewed a plan from the Invermere Forest District to establish a demonstration area for thinning.

Drs. Safranyik and Shore reviewed: (i) B.C.F.S. manuscripts on the history of MPB outbreaks in the Flathead Region of B.C. and on the history and present use of pheromones for bark beetle management in B.C., and (ii) provided technical information to the pest management coordinator of the Cariboo Forest Region with regard to the Ips pine engraver problem. Dr. Safranyik advised the Nelson Forest Region on mountain pine beetle productivity conducted a field assessment of the status of mountain pine beetle in the Prince George Region, advised Mr. P. Wood of Vancouver about Ips and mountain pine beetle problems and population levels in the Cariboo, advised Mr. D. Livingstone of Weyerhaeuser Ltd., about the use of trap trees against the spruce beetle, and chaired the Interagency Bark Beetle Committee meeting in Invermere, B.C.

Dr. Sahota organized and edited a special volume of Entomological Society of Canada memoirs with international contributions, provided consultation and materials to Dr. A. Fontaine of University of Victoria for x-ray microanalysis of cuticle hardening agents in Mountain Pine Beetle and cone and seed insects, and provided guidance to Dr. J. Owen's graduate student regarding the use of our chromatin distribution patterns technology in his cell-cycle study.

Dr. Peet presented seminars at the Dept. of Soil Science, University of Alberta; the Faculty of Forestry, University of British Columbia; the College of New Caledonia, Prince George; and the Agriculture Canada Research Station, Lethbridge, Alberta. Dr. Peet provided information to Laurentian Forestry Centre on digital imaging and tree-ring measurements.

Projections

To publish management guidelines for the spruce beetle, and to continue studies of mountain pine beetle biology and management.

M.A. Hulme

J.W.E. Harris

H.A. Moeck

I.S. Otvos

R.F. Shepherd

H.S. Whitney

Biological control of forest pests

Project Leader: Dr. M.A. Hulme
Professionals: Dr. J.W.E. Harris, Dr. H.A. Moeck, Dr. I.S. Otvos, Dr. R.F. Shepherd, Dr. H.S. Whitney
Technicians: A. Dawson, T.G. Gray, M. Talmon de l'Armee

Objectives

To evaluate the use of natural enemies as control agents for forest pests and, where appropriate, incorporate natural enemy manipulations into forest pest management strategies.

Achievements

Two lines of research continued to be aimed at developing control methods for mountain pine beetle. Culture methods were devised, which produced enough Beauveria bassiana spores of high stability to conduct small field trials without inoculum extenders or carriers. For the first time in the field, the mortality of caged adult mountain pine beetle that were auto-inoculated with B. bassiana was equivalent to that from topical inoculation. Experiments are continuing with clerid beetles predacious on bark beetles. Coloured mutants have been obtained in laboratory culture that may provide genetic markers to identify offspring of clerids in release studies in the field.

A further method was developed for obtaining natural enemies of spruce weevil by caging leaders containing weevil brood and using mesh with precise specifications. Weevils are retained, whereas the natural enemies are able to crawl out. A trial aimed at reducing weevil infestations by using this separation technique was started. Leaders were clipped and returned to the field in cages to avoid removing the natural enemies.

Pheromone-trap catches indicate that Douglas-fir tussock moth populations are increasing. A workshop was held to alert and prepare forest managers for the impending outbreak. One option is to use the virus treatment demonstrated in previous years.

Spring, summer and fall sampling of larch casebearer infestations showed that the pest population generally remained low. Overwintering loss of casebearer populations was almost 25%. The introduced eulophid Chrysocharis laricinellaewas the most common parasitoid found. Following the introduction of two species of parasitoids, populations of winter moth and attendant defoliation of oak and fruit trees continued to decline.

The sex pheromone for black army cutworm was isolated and identified, and a non-saturating moth trap has been selected for monitoring populations of the pest, as an aid for making decisions on pest control.

Projections

Experiments are being developed to establish what effect auto-inoculation of mountain pine beetle with B. bassiana will have on generation survival of field beetles lured to trap trees with pheromone baits. Exotic clerid species from Europe will be imported to assess their potential usefulness against mountain pine beetle. The testing of leader clipping without destruction of weevil natural enemies will continue in attempts to control spruce weevil. Possible kiaromones involved in host/prey location are also being explored. Monitoring of larch casebearer is being intensified to assess the effect on pest populations of earlier introductions of two European parasitoids.

W. J. Bloomberg

K.E. Finck

G.D. Jensen

D. Morrison

Protection of second growth stands from root and stem diseases

Project Leader: Dr. W. J. Bloomberg
Professionals: K.E. Finck, G.D. Jensen, Dr. D. Morrison
Technicians: D. Chu, A. Hall, A.L.S. Johnson, G. Reynolds

Objectives

To define the epidemiology and impact of root and stem diseases in second-growth stands; to develop control strategies; to expedite application of research results, and to act as resource personnel or project leaders on Forest Resource Development Agreement (FRDA) projects related to root and stem diseases.

Achievements

A comprehensive analysis was started of 30-year records of root disease in three plantations on eastern Vancouver Island. The plantations have been examined at approximately five-year intervals since 1958, when they were 15 years old. All trees (approximately 17,000) have been stem-mapped, and their growth and disease condition have been recorded at each examination. The data has been stored in the computer and a program has been written to facilitate retrieval and analysis of the records. The analysis will show how the diseases develop over time and space relative to various tree growth parameters.

Responding to the need for more user-oriented computer programs to estimate the effects of root diseases in forest stands, conversion of mainframe models to personal computer (PC) format was initiated last year and should be completed soon. The use of menu-formatted inputs and color graphics to show the healthy, infected and killed areas in stands will show the impacts of root

disease under various stand conditions.

A Phellinus root rot management cooperative has been formed to make the best use of available expertise and resources of universities, government research agencies and the forest industry. The cooperative will serve as a clearinghouse for information, a vehicle for collaborative disease research and management, a vehicle for possible funding and a spokesgroup for root diseases.

An initial attempt to derive clones of Douglas-fir exhibiting apparent resistance to or recovery from Phellinus weirii attack by rooting cuttings led to the establishment of clones of 10 trees from two sites for future inoculation experiments. An additional 8 candidates for resistance or recovery from a third site were identified, and cuttings from these have been set to establish additional clones.

A study was begun, on Vancouver Island, to investigate the effects of juvenile spacing on a Douglas-fir plantation infected with Phellinus weirii. The study will compare the spread of the disease in unspaced, uniformly spaced and strategically spaced blocks. Comparisons of volume production will also be made among the treatments.

A growth impact study of interior Douglas-fir infected by Armillaria root rot was completed, and a report was submitted for publication. In research plots in widely separated locations of the Interior Cedar-Hemlock zone, reduction of tree volume growth was consistently recorded in relation to severity of the disease. Analysis of stem growth indicated that reduction may take place over 20 years or more prior to tree death.

In Douglas-fir plantations in the Nelson Region, the root system of 12, 8-year-old; four, 14-year-old; and three, 20-year-old trees were excavated to determine extent of root system, incidence and location of Armillaria ostoyae infection, source of inoculum and tree age at infection. In each plantation, most threatening infections occurred within 30 cm of the root collar. Infections on lateral roots more than 30 cm from the root collar were often checked. Rhizomorphs produced from colonized residue within 20 cm of the tree were the principal source of inoculum. These results improved our understanding of disease epidemiology and supported efforts to model the disease in plantations.

Work continued on the skimikin stumping experiment, which was established in 1968. Mortality since the last examination in 1983 was recorded. Two of the three plots planted to each tree species or mixture of two species were thinned, using size and form as criteria. All remaining trees (5000) were tagged, and their DBH was measured; in each plot containing Douglas-fir or lodgepole pine, the height of four trees of each species was measured. Height and DBH of both species was significantly greater in the stumped block than in the untreated block. Cumulative mortality from Armillaria ostoyae since 1973 in the stumped and untreated blocks is 3% and 14%, respectively, in Douglas-fir and pine, the results are 1.4% and 14%, respectively. Phellinus weirii killed 0.2% and 5% of Douglas-fir trees in the stumped and untreated blocks, respectively; no pine were killed by this fungus. Planting alternate rows of susceptible and resistant or immune tree species reduced the number and size of root disease centers.

Technology transfer included lecture and field presentations to forestry schools, industry foresters, BCMOFL personnel and other members of the forestry community.

Involvement with related FRDA projects continued.

Projections

To supply forest managers with guidelines for recognition, risk assessment, impact estimation and control strategies for the major root and stem diseases.

G.E. Miller

R.S. Hunt

M. Meagher

R.N. Sturrock

E.E. White

Regeneration pests

Project Leader: Dr. G.E. Miller
Professionals: Dr. R.S. Hunt, Dr. M. Meagher
R.N. Sturrock, Dr. J. Sweeney, Dr. E.E. White
Technicians: H. Craig, D. Craigdallie, J. Dennis, G.R. Lait, D.S. Ruth, T.A.D. Woods

Objectives

Reforestation efforts in B.C. have increased significantly in recent years. This increase in activity stems from the Canada/British Columbia Forest Resource Development Agreement, which has as its primary objective the reforestation of unsatisfactorily restocked forest land, in addition to increased planting by the B.C. Forest Service. The resulting increased emphasis on production of seeds and seedlings and establishment of new plantations has demonstrated the need for pest management programs in seed orchards, nurseries and young plantations. Two client surveys conducted in 1987-88 indicated that regeneration pests were amongst the highest research priorities in B.C. from the perspective of operational foresters. Development and improvement of the pest management systems requires research in both basic and applied aspects of regeneration pests. Development of western white pines that are resistant to white pine blister rust would afford a silvicultural solution for sites where Phellinus root rot is a problem, because of white pine's resistance to or tolerance of this disease.

With this as background, the objectives of the project are: i) to identify the major insect and disease pests of forest nurseries, seed orchards and reforested areas; ii) to develop pest-management strategies to keep the incidence of these pests below economic thresholds; iii) to develop techniques that allow early detection and meaningful predictions regarding the pests; iv) to evaluate the genetic interactions between western white pine and white pine blister rust through biotechnology; and v) to assist in transferring new technology that results from this research into operational use.

Achievements

Due to specific circumstances, fewer resources were allocated to the regeneration pest project in 1987-88 than in previous years. Most of Dr. Sutherland's time was redirected to pine wood nematode, and two vacancies (entomologist and protein chemist/immunologist) existed in the project. A post-doctoral fellow (Dr. J. Sweeney), joined the project as a cone and seed entomologist.

This year saw many major accomplishments. Publication of the results of fungicide trials against gray mould on container-grown seedlings were published. As a result, two new fungicides were registered for use against this disease (Sutherland). In collaboration with AFC Research, studies were completed on epidemiology of gray mould on container-grown seedlings and timing of fungicide applications for control of the disease (Sutherland). Dr. Sutherland organized and was appointed chairman of a IUFRO Working Party on diseases and insects of forest nurseries. In collaboration with the B.C. Forest Service, a methodology for estimating efficiencies in seed orchards was published (Miller). A summary of over 30 years of survey data for cone and seed insects has been prepared (Miller). Experiments concerning the influence of temperature on changes in haemolymph proteins related to dormancy in the pharate adults of Douglas-fir cone moth were completed (Sahota). A new leaf disease of aspen in northern B.C. has been isolated and cultured for further study (Funk). One hundred and fifty-five parent trees were selected for evaluation of resistance to blister rust in cooperation with the B.C. Forest Service and industry, and seedlings from about 60 parent white pine trees with blister rust were inoculated for evaluation of resistance (Hunt and Meagher). In cooperation with industry and the B.C. Forest Service, seven plantings were established for evaluating and demonstrating the resistance/tolerance of white pine to root rots (Hunt and Meagher). A physical map of chloroplast DNA of western white pine was completed and several genes were located (White). cDNA libraries were produced for comparing gene expression in blister rust inoculated and uninfected seedlings (White). Studies were initiated to develop damage-prediction methods for spruce cone and seed insects (Sweeney).

In spite of the reduction in resources during 1987-88, project scientists published six papers in scientific journals, three conference proceedings, one departmental publication and one FRDA publication. Project personnel presented lectures and workshops to forest community, scientific and university audiences. Two hundred and fifty letters and reports were prepared for enquiries from forest nurseries and seed orchards.

Projections

The vacancies in the project will be filled. Diagnosis and pest-management recommendations will continue for diseases and insects in seed orchards, nurseries and young plantations. Research on root rots affecting seedlings in container nurseries will be initiated. The manual of nursery pests (CFS/BCFS Joint Report No. 12) will be revised. An evaluation of cone-slicing as a method for indexing seed crops will be completed. The study on the physiology of dormancy in the Douglas-fir cone moth will be completed and terminated.

Approximately 180 more parent white pine trees will be selected and seeds from them collected for testing for resistance to blister rust. A further 6,000 seedlings will be inoculated with rust, and 18,000 previously inoculated trees will be examined for development of the rust. Six demonstration plantations of white pine will be established. cDNA libraries for blister rust-inoculated and uninfected seedlings will be screened. FRDA-related activities, such as monitoring research contracts, will also continue.

J.R. Sutherland

Pinewood nematode

Project Leader: Dr. J.R. Sutherland
Professionals: Dr. K. Futai (Visiting scientist; Japan), Dr. T.S. Panesar (post- doctoral fellow, Natural Sciences and Engineering Research Council)
Technicians: J. Seed

Objectives

To research the biology, pathology and hosts of the pinewood nematode (PWN) on Canadian tree species, and to answer questions that Canadian, European and other officials raise on these matters. To study PWN survival in forest products. To serve as scientific authority for CFS funded contract research on PWN.

Achievements

Pathogenicity studies were completed in which seedlings of Scots and lodgepole pines were inoculated with two forms (m and r) of Canadian PWNs. Both nematodes were pathogenic to these pines, especially r-form nematodes. A host range study, made in a shadehouse, was completed with 24 species of Canadian conifers and four Canadian isolates of the PWN. Another pathogenicity study was completed using Canadian m and r nematodes and, for comparison, a Japanese PWN isolate on Scots pine, black spruce and western larch. In this study, physiological parameters associated with disease development were determined, as was the attractiveness of host extracts to PWNs. Studies were also begun on the effect of relative humidity, temperature and other parameters on PWN survival in wood chips. Dr. Sutherland served as scientific authority for two research projects (ca $400 K) on PWN at Simon Fraser University and met with delegations from Sweden and Norway regarding co-operative research. Project personnel prepared one abstract and two manuscripts for publication.

Projections

The host range study that was done last year in the shadehouse will be repeated in a greenhouse using higher temperatures. A manuscript will be prepared using the results from these two experiments. Studies on the effect of relative humidity on PWN survival will be completed and a manuscript

prepared. Pathogenicity studies will begin, in which environmental parameters such as soil moisture stress will be studied in relation to disease development and severity. Nematologist Yang Baojun from the People's Republic of China will join the project for one year. Liaison and related duties will be maintained for contract research. Contact with European and other scientists will be of major importance.

Forest Development

M.J. Heit, Senior Program Director, Development

V.G. Ulrich

M. Atherton

J. Burch

W. Matosevic

D. Mills

A. Robinson

W. Stokes

Program implementation

Project Leader: V.G. Ulrich
Professionals: M. Atherton, J. Burch, W. Matosevic, D. Mills, A. Robinson, W. Stokes

Objectives

To represent CFS responsibilities and interests in the implementation of forest development initiatives, which currently focus on programs under the five-year, $300-million Canada/British Columbia Forest Resource Development Agreement (FRDA). To provide program marketing, proposal development, and administrative, monitoring, extension and liaison services required in the implementation of FRDA and other related funding programs.

Achievements

The FRDA Program, which expires March 31, 1990, has now completed its third year with expenditures to date of $144.8 million. These were directed to backlog reforestation, intensive forest management, research, evaluation and implementation activities. Of this, $114.1 million has been cost shared with the Province and $13.4 million implemented directly by CFS. Planning was completed for an expenditure of $77.1 million in the 1988-89 year. Work continued on developing a comprehensive FRDA statistical data base (DEVMIS). Activities included acting as the secretariat to the FRDA Management Committee, providing liaison with internal and external auditors, monitoring of the provincially implemented cost-shared components of FRDA and the preparation of briefing notes and annual reports. PFC also hosted the annual national meeting of senior implementation officers.

The CFS participated in negotiating a tripartite agreement with the Province and the B.C. Research Council (BCRC) to establish a new Forest Biotechnology Centre to which CFS, through FRDA, will contribute $874,000 over three years. Liaison continued between the CFS and other agencies, universities and industry to achieve co-operative effort on a number of forestry development projects. A Forest Industry Advisory Committee representing all the major users of the forest resource was established to provide dialogue and feedback to the FRDA Management Committee.

Projection

To continue to provide information, implementation and monitoring services for FRDA and other CFS development programs. To provide liaison with the province, industry, universities and other agencies to ensure maximum utilization of FRDA opportunities. To carry out a FRDA mid-term assessment, and to participate in dialogue on potential future forest development initiatives.

Mark Atherton

FRDA Indian Forest Lands Program

Program Coordinator - Mark Atherton, R.P.F.

Objectives

To promote and manage the Indian Forest Lands Program, a CFS-managed component of the Canada/British Columbia Forest Resource Development Agreement (FRDA). To assess the forest potential and increase the productivity of forest lands on Indian reserves, thereby contributing to the social and economic benefit of band members.

Achievements

During the first three years of the five-year, $7-million program, 84 inventories were completed at a cost of $2.1 million, from which 72 forest management plans were developed. A multiple-agency advisory committee, which includes five representatives of the Indian bands, reviews all proposals, which are implemented using forestry consultants and contractors. FRDA has been an important vehicle for creating a broad awareness of the benefits of good forestry management on Indian lands. FRDA has also assisted the formation of an Indian Forestry Council, created to provide a vehicle for cooperation among Indian bands and tribal councils to achieve long term improved forest management.

Projections

Silvicultural activities based on prescriptions contained within the management plans are expected to substantially increase funding commitment levels. The budget for the 1988-89 fiscal year is over $2 million, with which approximately 80 additional projects will be developed on reserve lands throughout B.C.

J. Burch

FRDA Private Forest Lands Program

Program Coordinator - John Burch, R.P.F.

Objectives

To provide an opportunity for landowners to bring their potentially productive forest land under intensive management, thereby contributing to the social and economic benefits available to B.C. through the CFS-managed component of the Canada/British Columbia Forest Resource Development Agreement (FRDA).

Achievements

During the first three years of this five-year, $7-million program, FRDA has contributed $1.5 million to assist landowners with 165 projects. This has helped in the completion of forest inventories and management plans, and the carrying out of reforestation and intensive stand management on their forest lands. To date almost three million dollars have been committed to Private Lands Program projects. A detailed study of privately held lands in B.C. was completed, and it indicates that there are some 1.3 million ha of potentially productive private forest land, more than double the amount indicated in earlier estimates.

Projection

Awareness of the program is now rapidly expanding, as is the number of applications. The Private Lands Program has a budget of $2 million in 1988-1989 which could fund an additional 100 projects.

A. Robinson

FRDA Federal Forest Lands Program

Program Coordinator - Arthur Robinson, R.P.F.

Objectives

To provide technical forestry assistance and support to other federal agencies in developing integrated management plans on forest lands that they control, and to encourage the implementation of intensive management practices on their potentially productive forest lands.

Achievements

Inventories and management plans have been completed for lands controlled by the Department of National Defense (DND) and the Dominion Coal Block, and are being considered for some Department of Transport and Department of Fisheries and Oceans properties. The first timber harvesting and forestry operations projects, which were carried out on DND Nanoose Bay sites, generated over $100,000 in net revenue. The project included the planting of 24,000 seedlings, the undertaking of commercial thinnings and other silviculture activities. These initiatives have been made possible through the resources of the FRDA program.

Projections

Forestry activities will be expanded. A second DND project, at the Rocky Point property on the southern tip of Vancouver Island, will be carried out during the coming year. Integrated projects such as these will serve as models for small-scale forestry and multiple-resource use on other properties.

W. Matosevic

CFS Prince George District Office

Forestry Officer - Walter Matosevic, R.P.F.

Objectives

To provide access to CFS programs, and support CFS objectives in the interior and northern areas of B.C. This includes the dissemination of research results, assistance to the Private, Indian and Federal Forest Lands FRDA Programs and liaison with industrial, educational, and other agencies on special projects.

Achievements

The Prince George office has assisted in the development and administration of 56 private and Indian lands FRDA projects, and provided liaison with nurseries, industry, and the New Caledonia College. It has also been active as a base of operations for research projects, and in providing an effective avenue through which the region can communicate its particular needs and concerns.

Projections

The importance of the Prince George office is expected to increase as a convenient CFS contact for industry, the public and other agencies in central and northern British Columbia.

J.P.G. de Lestard

Forestry relations and technology transfer

Project Leader: J.P.G. de Lestard
Professional: A. Shortreid

A. Shortreid

Objectives

To establish and maintain contact with the forestry community and the public sector in an advisory and consultative capacity, and to promote and strengthen CFS research and development initiatives and programs in the Pacific and Yukon Region. To provide selected technology transfer services to PFC staff and clients. To provide professional support during the development and implementation of forestry agreements.

Achievements

Contact with the forestry community and the public sector promoted forestry relations and generated technology transfer opportunities. Highlights included: representing the CFS at forest industry and advisory committee meetings; serving as program chairman for Canadian Institute of Forestry's Vancouver Island Section; providing CFS liaison to the Greater Vancouver Regional District's Seymour Demonstration Forest project; serving as course evaluation facilitator for the Silviculture Institute of B.C. preparing key ministerial briefing notes; organizing tours for the Minister of State (Forestry and Mines) and other dignitaries, including numerous international visitors and the 1990 IUFRO, Post Congress Excursion - The Far North; speaking to forestry and public groups; obtaining speakers for PFC Seminars; promoting the CFS with displays at special functions; participating in a Designing a curriculum exercise for restructuring B.C. Institute of Technology's Forest Resource Technology program; serving as Section Chairman (Federal Government) of the United Way Campaign of Greater Victoria; organizing technical workshops; and establishing new program strategies with the Technology Transfer and Development Officer.

In January 1988, a new technology transfer and development officer was hired. Following an orientation period, his activities included the following: initiation of a survey to assess PFC staff and client technology transfer requirements; attendance at workshops and meetings of professional foresters, national information officers and silvicultural committees; evaluation of GIS software options for the Nicola Valley Indian Administration; providing assistance with a major GIS conference in Edmonton; and assisting PFC scientific staff with patent investigations and applications and related legal matters.

Projections

Liaison activities will continue to be expanded throughout the forestry community and public sector in the Pacific and Yukon Region. Ongoing communications and visitations are expected to encourage clients and potential clients to capitalize on CFS regional and national research and development programs and accomplishments. Emphasis will be placed on stimulating increased awareness of the economic, social and environmental benefits being derived from the Canada-British Columbia Forest Resource Development Agreement. Technology-transfer advisory and operational services will be expanded to assist clients with forestry computer applications.

G.H. Manning

G.M. Townsend

W.A. White

Development of economic guidelines

Project Leader: Dr. G.H. Manning
Professionals: Dr. G.M. Townsend, Dr. W.A. White
Technician: C. Macklin

Objectives

To provide economic and policy advice to the department, its cooperators and the management and staff of PFC, to improve the information base in forest economics, and to manage PFC's participation in the Energy from the Forest, (ENFOR) program.

Achievements

The major thrust of the project continued to be support of the Canada-B.C. Forest Resource Development Agreement (FRDA). Economic studies underway included further investigation of forest-dependent communities, the cost of logging second-growth coastal timber, specific machinery requirements for logging second-growth timber, terrain conditions found in second-growth lodgepole pine stands, the economics of logging mixed red alder-Douglas-fir stands, and a number of studies related to forest management decision models.

With regards to ENFOR in 1987-88, two contracts were in progress: an economic evaluation of the machine development sub-program at PFC, and an inventory of hog fuel in the Interior and North Coast Regions

Projections

The project will continue to provide planning, economic and policy advice and liaison as required by CFS/PFC staff and other client agencies. Specifically, FRDA-related studies will continue, as will studies related to marketing and utilization opportunities for B.C. forest industries. Forest management decision modeling will also continue, as will management of the Centre's ENFOR program.

Administration

R.M. Dean, Management Services Officer

R.M. Dean

W.D. Evans

E.K. Hopps

H. Gray

Administration

Management Services Officer: R.M. Dean
Finance Officer: W.D. Evans
Physical Plant: E.K. Hopps
Photographer: E. Chatelle
Material Management: H. Gray
Administrative Support: J. Andersen, D. Barwise, P. Chambers, S. Flarrow, B. Gee, D. Greenway, R. Hagel, H. Hendriksen, J. Horsland, E. Hosie, A. Inness, M. Johnson, G. Kazmiruk, J. Lum, H. Matson, R. McPhee, M. Mosley, W. Pearce, S. Reid, R. Richardson, S. Fitch, J. Strobbe, B. Vander Heiden
Casuals: P. Bauer, D. Brady, S. Van Ek

Objectives

To provide general administrative support services including material management, financial services, records management, word processing, secretarial services, fleet management, and reception-switchboard services. To provide a system of financial control and accountability in accordance with statutory and regulatory requirements. To provide physical facilities support for the Centre and 12 field stations.

Achievements

The financial unit maintained an effective person year reporting system and increased the availability of financial reports. The unit also increased the monitoring of contribution agreements and improved the Forest Resource Development Agreement coding procedures. Implementation of the MMIS system commenced late in the fiscal year and will continue into 1988-89. Eight new vehicles were purchased and eight vehicles were disposed through Crown Assets. All building services were maintained in support of the research programs, while savings resulted from decreased energy consumption. The field station upgrading program continued with the replacement of the Summerland Station and a major upgrading of the services for the Williams Lake Station. The unit was also successful in addressing the majority of the deficiencies that remained at the completion of the construction of the new laboratory.

Projections

Administrative and support services will continue to be provided to the research and development programs on a timely basis. Improvements to the power and water systems will be completed for the Williams Lake station and other stations will be evaluated for maintenance requirements. Emphasis will be placed on maintaining and improving the growing environment in the GH/SH in support of new research projects.

Suitable transportation will be provided to research and technical staff

for field operations, and a review of the needs of two mobile field stations will be completed. The unit will continue to be responsible for ensuring that management controls are in place and essential information is provided to the decision-making levels.

Information and Editorial Services

E.L. Teske, Head

E.L. Teske

S. Glover

Information and editorial services

Project Leader: E.L. Teske
Professional: S. Glover
Support: L. Donk, J. Wiens

Objectives

To provide the Centre with editorial and graphic services; to act as the channel through which contact is developed and maintained with the public, the forest community, national, regional and local news media, editors and printers; to produce booklets, news releases and to handle telephone and written enquiries.

Achievements

In support of ongoing programs at the Centre, staff provided editorial and graphic services; answered enquiries from clients; published 4 issues of "Information Forestry" magazine; issued news releases, backgrounders and speeches; maintained contact with media; organized seminars and workshops; and published 11 Information reports, 32 journal articles, 18 contributions to symposium proceedings and 22 miscellaneous reports. A 14-minute video on the programs and activities of the Centre was also produced for use in conjunction with tours of the facilities.

Support was provided to the British Columbia Forestry Association to produce a weekly newspaper column entitled "Ask About the Forests", to develop a forestry badge for Girl Guides, and to provide and distribute support material for National Forest Week. Funding was also given to the Truck Loggers Association to facilitate school tours at their annual convention and logging show. The Festival of Forestry Society was also provided funds to stage tours of logging operations and forest management sites for school teachers. A video was produced to promote the CFS's federal forest lands program under FRDA.

In conjunction with the B.C. Ministry of Forests and Lands, under the cost-shared portion of FRDA a number of new communication initiatives were launched. Some 24 non-profit organizations throughout B.C. were given nearly $105,000 to promote forest awareness and education under the Green Gold Grants Program. A print- and radio-media program was developed and distributed to community newspapers and radio stations throughout B.C. to promote National Forest Week. As FRDA reached the midpoint of its duration a series of newspaper ads and news feature articles were written and distributed to promote awareness of the achievements and impacts of the Agreement.

Projections

To continue to promote activities and programs of the Canadian Forestry Service in the Pacific and Yukon region by providing graphic, editorial and public- and media-relations services. To cooperate with the provincial forest service to implement and deliver the Green Gold Grants Program and other cost-shared communications programs under FRDA, including coordination of a speakers bureau, production of a major mall display and publishing and distribution of brochures and leaflets promoting the activities and accomplishments of FRDA.

Planning and Technical Support Services

J.G. Skinner, Manager

J. G. Skinner

L. Manning

A. Solyma

A. Van Niekerk

Planning and research support services

Project Leader: J. G. Skinner
Professionals: L. Manning, A. Solyma
Technician: A. Van Niekerk
Support: M. Mitchell

Objectives

To provide planning services to PFC Management; to provide research programs at PFC with inorganic chemical analysis services, light- and electron- microtechnique services, and comprehensive library information services; to provide technical and library support services for FRDA; and to develop and refine techniques, skills and methodology as these diverse objectives require.

Achievements

Planning Services implemented the Management Information Planning System (MIPS) as one element of an integrated information system for decision making and completed coordination of the 1987-88 work plan.

Chemical Services analyzed 22,400 units on 1303 samples of mineral soil, duff material, plant tissue, water and fertilizer from 12 PFC studies, several FRDA-based and cooperative studies with other CFS centres, as well as one from the private sector. Chemical Services also participated in the cooperative education program of the University of Victoria, and provided assistance to staff from other projects within PFC and B.C. Forest Service using the facilities of the laboratory.

Microtechnique Services were required by 22 studies and involved Scanning Electron Microscope, Transmission Electron Microscope and light microscopy of wood, leaf, root and bud tissue; insect eggs, larvae, pupae and adults; fungal spores and hyphae; and bacteria. The microscopy facility also cooperated with and assisted the Royal British Columbia Museum, the Department of National Defense, Forest Pest Management Institute and CIP Industries. Several specific requests from local teachers and visiting tour groups were also accommodated.

Library Services implemented a weekly electronic information service to announce new library acquisitions; conducted, with the library committee, a major subscription review resulting in a proposed action plan for management; delivered 730 on-line database searches; supplemented PFC information by borrowing 480 documents from other libraries; received 14,400 pieces of printed information; hosted the National Library of Canada DOBIS training session and seminar; and coordinated and chaired the 1987 CFS Library Network annual meeting in Ottawa. Library clientele visits per month increased to 720 in 1987-88 from 670 in 1986-87.

Projections

To develop the regional input to the CFS Management Information Reporting Systems.

Requisitions for inorganic chemical analysis are expected to total 28,000 units based on preliminary estimates. A microwave digestion apparatus will be installed to provide a more efficient alternative in preparation of samples for further instrumental analysis.

Microtechnique requests indicate services required by 25 studies for SEM, TEM and light microscopy. A transmission electron microscope will be installed to complete the electron microscope facility at PFC.

To initiate automation of library operations through implementation of the SYDNEY Integrated Library Management System; to interface the system with ALL-IN-1; to develop a retrospective conversion plan; and to introduce end-user on-line searching using CD-ROM products.

To continue to provide all these support services as required by the staff at PFC.

D. Say

Computing Services

Project Leader: D. Say
Professionals: S. Alers, S. Moncrieff
Support: J. Foster

S. Alers

S. Moncrieff

Objectives

To provide computing facilities and general computing support for PFC staff and to support program requirements.

Achievements

Training was carried out for the office automation system installed last year. Over 120 managers, research scientists, professionals, technicians and administrative support staff were trained.

The CFS work planning system was redesigned, coded and implemented to save the PFC planner weeks of effort. This improved version allows for future integration with financial and personnel databases.

Specifications were designed, and an electronic publishing system for PFC was identified.

A power conditioner was installed to protect the computing facility at PFC. With the implementation of office automation, staff became much more dependent on the central computing facility. The conditioner will insure a greater percentage of computer "up-time."

A center-wide mailing list database was developed and implemented.

Work was completed on the installation of the GANDALF PACX 2000 communications exchange. The new exchange will allow 256 potential hook-ups to the VAX.

Staff also provided assistance in the development, implementation and maintenance of scientific and system software.

Projections

To install and implement the proposed electronic publishing system.

To install and implement a computerized library information system to improved efficiency and improve the timeliness of inventory updates.

To purchase additional computer hardware to provide enhanced support for all staff.

To continue to provide computing support services in the areas of hardware, office systems, and management software information systems to PFC staff.

Personnel Services

F.L. Scott, Manager

F.L. Scott

Personnel

Regional Personnel Manager: F.L. Scott
Staffing and Human Resources Officer: S. Robson
Compensation and Systems Supervisor: J.L. Rodway
Pay and Benefits Clerk: E.A. Avis

Objectives

To fulfill a dual role by assisting program management in carrying out human resource management functions and providing personnel services to employees in accordance with legislation, regulations, policy and procedures. Personnel administration support is provided in pay and benefits, staffing, human resource planning, employment equity, classification, and staff relations. Personnel service and advice provided on a delegated and co-located basis to an average of approximately 200 indeterminate and term employees. There are 27 different groups represented within all occupational categories.

Achievements

Personnel management and accountability have been conducted in accordance with delegated authority and statutory and regulatory requirements. Personnel staff have received computer terminals and have been trained in office automation procedures. Progress has been made in automating manual records and procedures, and a review has been conducted on the effects of automation on the regional personnel program.

Projections

Personnel services and support will continue to be provided to employees and to research and development programs. The increasing emphasis in advisory services, human resource planning and systems work is expected to continue. Further benefits are anticipated from new technology, such as on-line pay and the implementation of the departmental human resource information system.

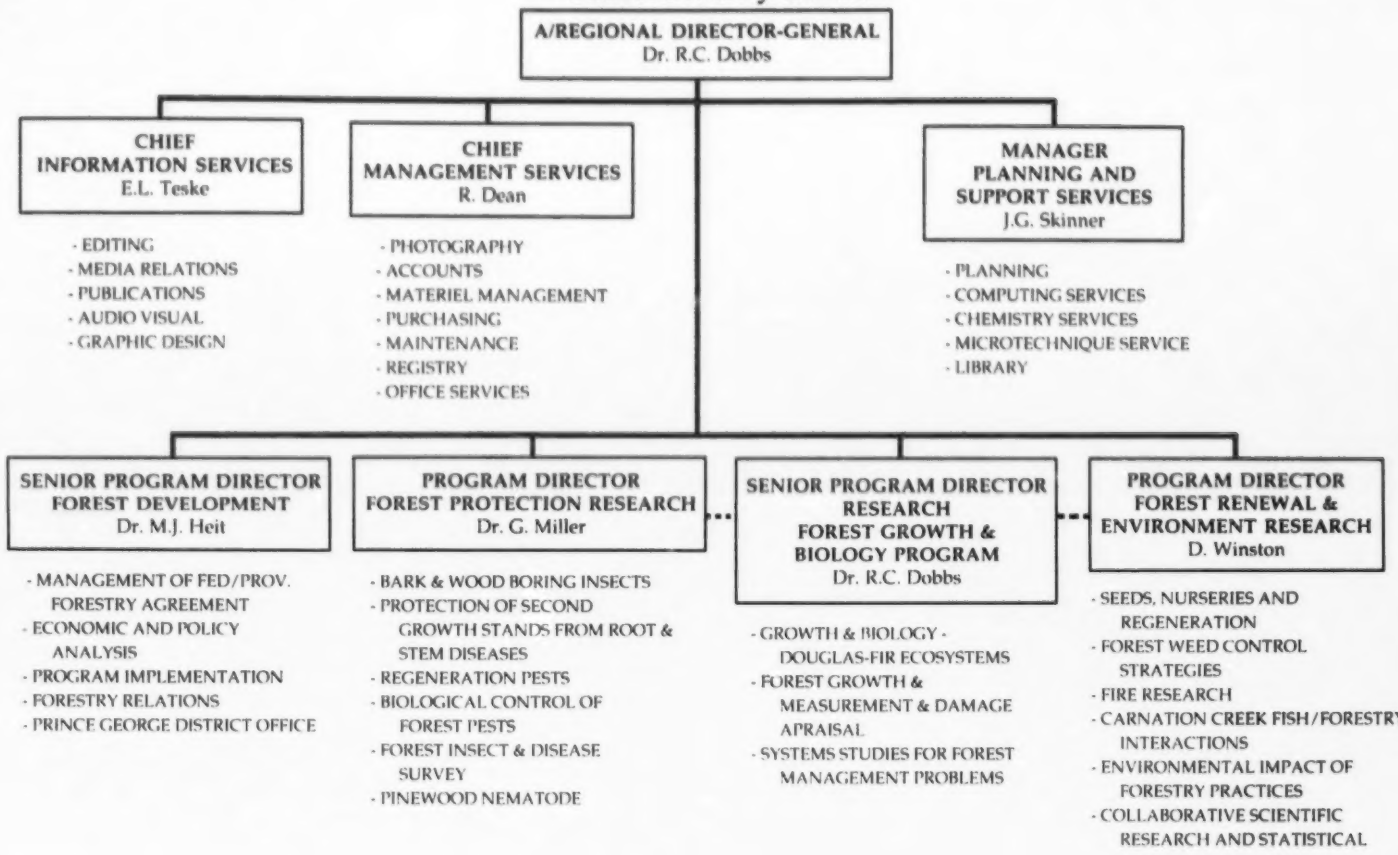
Appendixes

Pacific Forestry Centre

1987-88 Expenditures

Program	Person Years	Salaries	O&M	Capital	Contributions	Total
Directorate	1.75	$154.7	$16.1	$0.0	$0.0	$170.8
Information	5.00	$174.7	$86.7	$0.0	$0.0	$261.4
Management Services	30.03	$879.8	$706.7	$420.8	$0.0	$2007.3
Planning and Technical Services	11.45	$517.4	$145.4	$57.2	$0.0	$720.0
Growth and Biology	18.41	$898.0	$126.4	$10.0	$0.0	$1034.4
Protection	53.31	$2468.2	$339.5	$10.4	$0.0	$2818.1
Environment	28.44	$1498.5	$148.6	$24.4	$0.0	$1671.5
Development	7.95	$524.6	$105.2	$0.0	$0.0	$629.8
FRDA	15.72	$639.5	$1334.1	$60.0	$34 994.0	$37 027.6
Total	172.06	$7755.4	$3008.7	$582.8	$34 994.0	$46 340.9

Pacific Forestry Centre



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